Session 2

First detailed polarimetric study of a group of type-III solar radio bursts with the Murchison Widefield Array

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Magnetic reconnection is a well-known process for acceleration of electrons in the solar corona. When streams of semi-relativistic electrons travel through the hot magnetized coronal plasma along open magnetic field lines, it can result in type-III solar radio bursts by plasma emission mechanism. These radio emissions are among the most widely studied solar phenomenon at meter-wavelength. However, most of these studies are limited to the analysis of their dynamic spectra, which do not provide any information about the structure and location of these sources. The emergence of new generation telescopes like the Murchison Widefield Array, and our recently developed full Stokes calibration and imaging pipeline (P-AIRCARS, Kansabanik et al. 2022), now enables us to produce spectro-polarimetric snapshot solar radio images with high fidelity and dynamic range. This allows us to obtain polarimetric properties of these bursts in unprecedented detail and has already led to a few interesting discoveries. Circular polarization of type-III radio bursts are well reported in the literature. Theoretically one expects any linear polarization, even if present, should get washed out due to the large differential Faraday rotation in the corona. On the contrary, we have found the first convincing image-based evidence of linearly polarized emission from these bursts. We note that the linear polarization fraction is greater than the circular polarization fraction and they are anti-correlated throughout the burst duration. This suggests the possibility of the conversion of circular to linear polarization while the radio wave is travelling through the magnetized and inhomogenous corona. Here we will present our findings about the polarization of these type-III solar radio bursts.